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Reply

We thank Drs. Marenzi and Aspromonte for their thoughtful comments, which seemed to share the same consideration we have discussed at length that both cardiac and renal compromise may be too far gone to benefit from hemodynamic improvements achieved via slow continuous ultrafiltration (SCUF) in patients refractory to standard medical therapy (1). Our nephrology consultants customarily prescribe renal replacement therapy upfront if there were any clinical suspicions of established or evolving acute kidney injury. In addition, only those who had received at least 48 h of SCUF without the need for renal replacement therapy conversion were included in the analysis. Therefore, the likelihood of a progressive acute kidney injury scenario is relatively low in our study cohort. We agree with Drs. Marenzi and Aspromonte that excessive fluid removal at a rate inadequately balancing plasma refill rate may pose detrimental consequences. Nevertheless, our SCUF protocol was collaboratively conducted by nephrologists and cardiologists with direct central hemodynamic measurements as well as careful clinical monitoring in a dedicated heart failure intensive care unit. Therefore, we have reliable assurance that the large majority of subjects were able to maintain adequate intravascular filling pressures (Fig. 1 in the original paper). This may also be reflected by the lack of significant changes in hemoglobin or albumin over time (1). The divergence between total protein measurements and hematocrit was likely due to the relatively large variabilities in a relatively small sample size (of note, the mean admission total protein was 6.3 ± 1.1 g/dl) rather than overzealous removal of salt and volume.

The latest clinical guidelines in the care of patients with heart failure stated that "ultrafiltration is reasonable for patients with refractory congestion not responding to medical therapy" (2). While there are theoretical benefits and successful attributes of SCUF use in selective patients, recent prospective clinical trial data have provided the same cautionary note that SCUF may not be advantageous over intensive pharmacologic therapy in the setting of worsening renal function (3). Indeed, the invasiveness and costs associated with SCUF can only be justified if there is a consistent and reproducible benefit over standard medical therapies in a well-defined population. Therefore, it is our opinion that any further alternative explanations of discrepancies between perceived advantages and observed lack of benefits can only be clarified with refinement in techniques for this challenging population and further careful clinical investigations.

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